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Navigating a fractured future
Insights into the future of the North American natural gas market

A report by the Deloitte Center for Energy Solutions and Deloitte MarketPoint

Deloitte Center for Energy Solutions

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Introduction

Over the past decade, the North American natural gas industry has transformed vast, previously uneconomic shale gas deposits into valuable energy resources. While the so-called "shale gas revolution" has dramatically revitalized natural gas exploration and production, increased supplies combined with the slowdown in demand resulting from the recent economic events, have sent North American gas prices down dramatically.

Accordingly, North American gas producers are currently facing a great deal of uncertainty. To unlock the potential of shale gas resources, large investments are needed. However, the investment decisions require an understanding of the rapidly changing market dynamics related to new gas supplies and uncertain demand growth. Those decisions are complicated by a plethora of interrelated domestic and international forces that influence the natural gas market in North America.

Producers are asking many important questions, including:

- How long will United States (U.S.) natural gas prices stay low, and will they ever achieve parity to other global markets?
- Will U.S. shale gas production continue its rapid growth and eventually overtake conventional production?
- Will low natural gas prices stimulate significant additional demand in the U.S. for power generation and for other sectors of the economy?
- How do changes in shale gas costs impact U.S. production and prices?
- How will the anticipated increase in global liquefied natural gas (LNG) supply affect the U.S.?
- Will the U.S. ever import large volumes of LNG, and how much of the existing regasification capacity will be utilized?
- Alternatively, will the U.S. become a long-term exporter of LNG?
- How will continuation of China's ravenous appetite for energy affect U.S. and world gas prices?
- How will the announced nuclear shutdown in Japan, Germany, and other countries affect worldwide gas demand, and what are the implications for the U.S.?

In order to address many of these questions, Deloitte utilized the analytical capabilities of Deloitte MarketPoint LLC ("Deloitte MarketPoint"). Deloitte MarketPoint applied its integrated North American and World Gas Models to analyze the future of North American gas markets under a range of assumptions. This paper summarizes the findings of several scenarios regarding the future of North American and global gas markets and offers related strategic insights.

North American gas producers are currently facing a great deal of uncertainty.

Executive summary

For this report, Deloitte MarketPoint used its World Gas Model (WGM) to analyze North American gas markets over the next two decades. The model, based on sound economic theories and detailed representations of global gas demand, supply basins, and infrastructure, projects market clearing prices and quantities over a long time horizon on a monthly basis. The model also helps provide a better understanding of fundamental market drivers and their potential impacts.

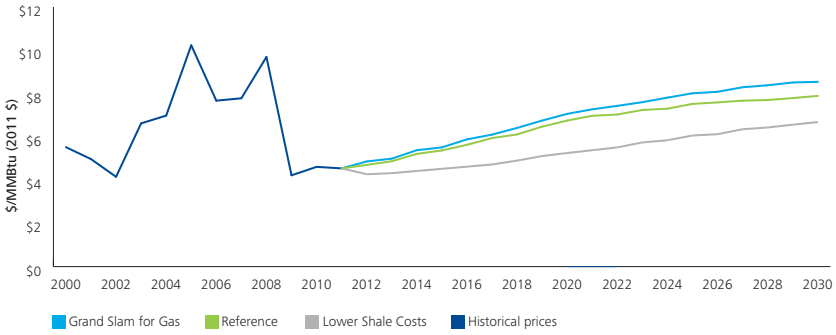
Our Reference scenario assumes current market trajectories without any major regulatory intervention. Under this scenario, worldwide economic growth rebounds fairly quickly from the recent downturn and resumes steady growth. World gas demand grows by 1.9% per annum through 2030. It assumes no U.S. regulatory policy restricting emissions of carbon dioxide (CO2), although there is tightening of mercury, nitrogen oxides (NOx), and sulfur oxides (SOx) regulations. Even without carbon legislation, gas demand for power generation grows rapidly as gas becomes the fuel of choice for new domestic power plants. It also assumes no new regulations or restrictions on the application of the hydrofracking process to produce shale gas. This scenario does not include the potential impacts from the announced shutdown of nuclear power plants in the aftermath of the Japanese nuclear disaster in March 2011.

We also present two alternative scenarios, one altering demand and the other altering supply. The first, referred to here as the "Grand Slam for Gas," is roughly based upon the high demand scenario described by the International Energy Agency's World Energy Outlook 2011. Under this scenario, global demand rapidly escalates as Asian demand, primarily from China, continues to grow at a rapid rate. Gas demand in China is projected to equal all of European gas demand by 2035. Furthermore, some leading nuclear power countries, including Japan, Germany, and the U.S., are assumed to shut down or scale back their nuclear energy production or expansion plans, leading to increased demand for natural gas.

Under the second scenario, referred to here as "Lower Shale Costs," we assessed the impact of lower shale gas production costs. While large volumes of shale gas are projected in our Reference case, much of it requires a relatively high wellhead price (> $8 per million British thermal units (MMBtu)) to make production economically viable. What if the costs were dramatically lower as some have suggested? In the Lower Shale Costs scenario, we lowered the cost to produce shale gas by about 50% to assess the impact on domestic and global prices.

Figure 1 shows the various paths that benchmark Henry Hub prices follow under the Reference scenario and two alternative scenarios. Prices in this and other charts are shown in real terms (i.e., 2011 dollars), unless otherwise stated. The projections of Henry Hub prices rise above current levels under all three scenarios. In an absolute sense, relative to the Reference scenario, the price impact of the lower shale gas cost scenario is much greater than the impact of the higher gas demand scenario.

Figure 1. Henry Hub price projection under the reference and alternative scenarios



One of the most significant insights that can be gleaned from modeling these scenarios is that prices rise to levels that are higher than current market expectations, as reflected in recent NYMEX futures prices. Under the Reference scenario, natural gas prices in real terms (i.e., today's dollars) grow by about 50% between 2011 and 2020, or 4.0% per year. Prices escalate in real terms, reflecting demand growth, the rising cost of finding and developing domestic gas resources, and the projected future costs of pipeline and LNG imports. However, despite burgeoning U.S. demand for gas-fired power generation, natural gas prices are not projected to reach the peak prices seen several years ago. In this scenario, with increased production from shale gas and the availability of other supplies, production costs will play an increasingly critical role in determining the value of individual gas resources. Cost is projected to be key to producer profitability.

Modeling these scenarios also shows that basis differentials are anticipated to diverge from historical relationships as new supply basins grow in prominence. Prices in different regions are projected to grow at different rates, altering pipeline flows and capacity values. The biggest change takes place in the Eastern U.S., where increased production from the Marcellus Shale is expected to displace supplies from the Gulf and other regions — a displacement that is projected to reverse some regional pipeline flows. The Western states, meanwhile, may experience rapidly rising supply costs due to an absence of significant shale gas resources, strong competition from other market regions for available supplies, and a regulatory environment that discourages LNG imports. As a result, prices are projected to escalate rapidly, which would leave California with some of the highest prices in North America. For midstream operators and investors, these basis shifts carry strong implications for the direction of flow and the value of existing and future pipeline capacity.

Another insight that may run counter to conventional wisdom is that in the Reference case, U.S. imports of LNG would increase substantially over time, although filling existing LNG import capacity is highly unlikely. Exporting LNG from North America to Europe and Asia, while tempting now, may not prove to be profitable over the long term, especially if future technological advancements do not continue to significantly drive down the cost of producing shale gas. The large current spread between depressed domestic prices and relatively high prices abroad has motivated some to analyze whether they should invest in liquefaction facilities to export LNG from the United States. However, it is anticipated that projected new supplies and pipelines over the next few decades will apply competitive pressures on Asian and European markets. Meanwhile, firming U.S. prices would narrow the spread with Europe and Asia. Based on the results of the modeling, global LNG production is set to nearly double between 2010 to 2030, which would make more gas available to the U.S. once higher priced foreign markets are satisfied.

North American natural gas market scenario

Scenario 1: Reference scenario

Under the Reference scenario, we assumed that continued economic recovery from the recent recession would spur steady growth in demand for natural gas in North America and worldwide, especially in non-OECD economies such as China and India. Projected world demand for natural gas, shown in Figure 2, grows at a yearly rate of 1.9% through 2030, with Asia and the Middle East showing the fastest growth, above 3% per year. Asian gas demand growth is led by China which is projected to continue its rapid growth, although not quite as fast as in recent years. We project during this time period an average annual demand growth rate of 4.6%, still quite high but much lower than China's growth rate of 13.8% per year during the past decade. In our scenario, growth in U.S. natural gas demand will be driven almost entirely by the electricity sector, which will grow at substantial rates. However, demand from other sectors is projected to be fairly flat, so the overall average annual demand growth is only 1.3%.

Fortunately for consuming nations, the world has abundant resources, although much of it in remote regions, to fuel robust projected growth in natural gas demand. Countries with significant but stranded gas supplies may seek to exploit their resources by producing and shipping LNG. In addition, countries which have so far been unable to develop their own supplies due to political and social issues, such as Iran and Venezuela, are expected to move past those issues in coming decades.

Figure 3 shows our projection of natural gas production by region.[1] Based on the assumptions in the Reference case, the Middle East is projected to provide much of the incremental supply, a direct consequence of the region's massive resources and forecasted increase in export capacity. The production rate in the Middle East is projected to nearly triple over the next two decades. Some of that production is projected to serve rapidly growing domestic markets while the rest is expected to go to other regions via LNG or international pipelines.

Figure 2. Projected world natural gas demand

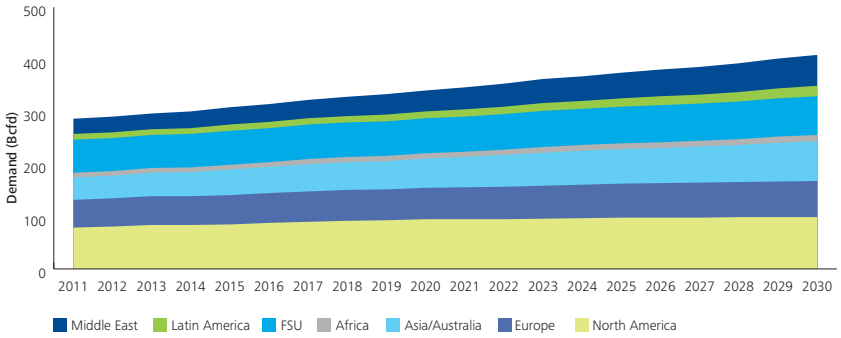
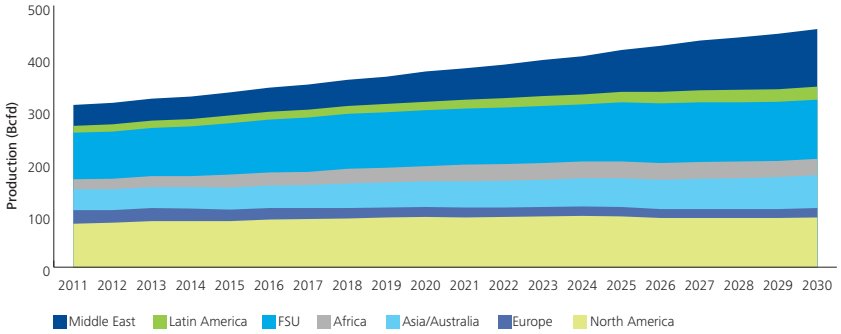


Figure 3. Projected world natural gas production



[1] Total production shown in this chart is higher than the total demand shown in Figure 2 because production represents marketed production (i.e., gross withdrawals from reservoirs minus reinjections and losses), while demand just represents end use consumption. The difference is due to gas usage and loss all along the supply chain including pipeline transportation, gas liquefaction and regasification of LNG, and LNG shipping.

Asia/Australia is projected to be the next fastest-growth region, but its growth in volume is considerably less than that of the Middle East. The former Soviet Union (FSU), including Russia and Caspian republics with prolific supply basins, is currently the largest producing region in the world. FSU production is projected to hold fairly steady and then grow moderately due to increased production out of Kazakhstan and Turkmenistan, both of which hold significant resources and relatively small domestic markets.

Perhaps somewhat surprisingly, North American production under this scenario is projected to remain fairly flat. The much-anticipated rise in shale gas production merely sustains current production. LNG imports become more competitive in the future, displacing some higher cost domestic production.

Growing global gas demand and resulting world gas prices may encourage countries with significant, stranded gas supplies to monetize their resources via LNG. In addition, political and social factors that have historically prevented development of supplies from some countries, such as Iran and Venezuela, are assumed to eventually diminish over time and allow these countries to develop supplies for export.

Key North American gas market findings

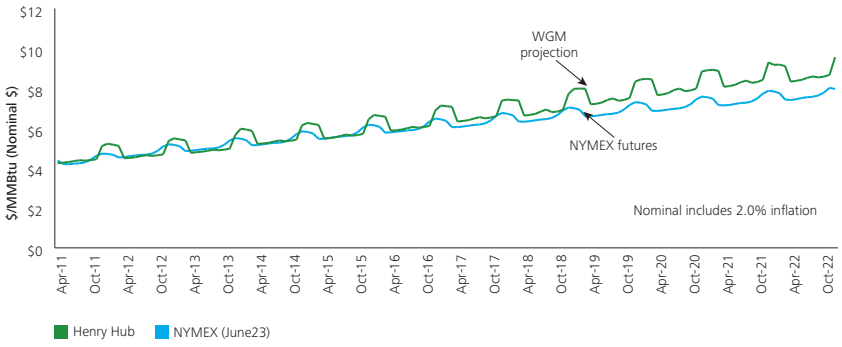
Deloitte MarketPoint's detailed market modeling and analysis suggest the following key effects on North American gas market fundamentals and prices:

1) **U.S. natural gas prices rebound.** Rising North American gas demand and dissipation of short-term factors that mask the full cost of supply may cause prices to significantly escalate. The Deloitte MarketPoint WGM projects monthly prices over a 30-year time horizon by simultaneously considering short-term dynamics and long-term fundamentals. Natural gas prices are projected to rebound from current levels and continue to strengthen over the next two decades, although nominal prices do not return to the peak levels of the mid-to-late 2000s until after 2020. In real terms (i.e., constant 2011 dollars), benchmark U.S. Henry Hub spot prices increase from an annual average of $4.53 per million British thermal units (MMBtu) in 2011 to $6.75 per MMBtu in 2020, before rising to $7.87 per MMBtu in 2030 in the Reference scenario.

   Escalating real prices by an annual inflation rate (estimated at 2.0%), yields nominal prices which can be compared to NYMEX futures prices. The nominal price in 2022, the final year of NYMEX futures prices, is projected to be $8.67, substantially higher than the NYMEX futures price (June 23, 2011) average of $7.66 for the same year. Current depressed natural gas price levels would likely be insufficient to induce natural gas producers to make the level of capital investments required to meet the projected strong rise in demand. As production depletes the "sweet spots" of gas deposits with the lowest production costs, prices ramp up to reflect the higher cost of production in new fields.

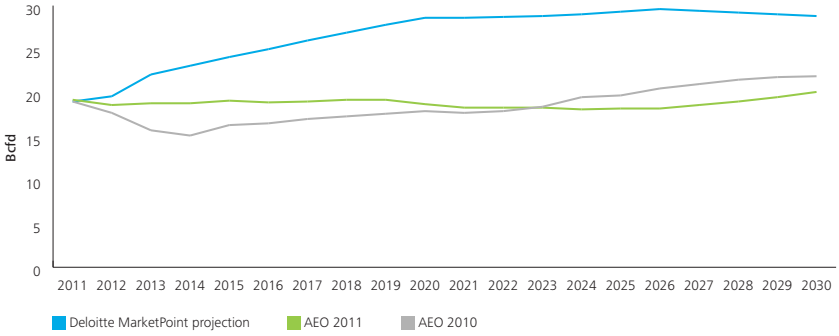
Our WGM projection of monthly Henry Hub prices for the Reference scenario is compared to NYMEX futures prices as of June 23, 2011 in Figure 4. Prices are shown in nominal terms (i.e., dollars of the day including inflation). Near-term projections are fairly consistent, but in the longer term, projected prices from the WGM rise significantly higher than the NYMEX futures prices. On an annual average, the projected prices are a dollar higher than the NYMEX futures prices in the longer term. Also notice the emergence of a summer mini-peak in price, reflecting growing gas demand for summer power generation.

Figure 4. Comparison between projected Henry Hub and NYMEX futures prices



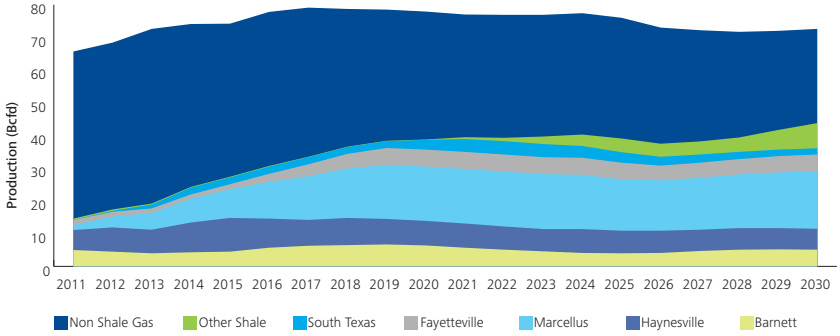
2) **Gas demand for power generation grows strongly.** Natural gas consumption for electricity generation is projected to drive North American natural gas demand higher during the next two decades. In the U.S., the power sector, which accounts for nearly all of the projected future growth, would increase by about 50% (approximately 10 billion cubic feet per day (Bcfd)) over the next decade. Based upon assumptions in the WGM, gas will become the fuel of choice for power generation for a variety of reasons, including: tightening environmental regulations; expectations of ample domestic gas supply at competitive gas prices; and the need to back up intermittent renewable sources such as wind and solar to ensure reliability. As shown in Figure 5, the projected gas demand for U.S. power generation gas is far greater than predicted by the Energy Information Administration's (EIA) Annual Energy Outlook 2011, which forecasts essentially no change.

Figure 5. Diverse projections of U.S. gas demand for power generation



3) **Shale gas becomes the dominant U.S. supply source.** Under the Reference scenario, improving gas prices spur North American hydrocarbon producers to ramp up activity in the continent's gas patch as the next two decades progress. As shown in Figure 6, shale gas production, particularly in the Marcellus Shale in Appalachia and the Haynesville Shale in Texas and Louisiana, continues to grow and is projected to eventually become the largest component of domestic gas supply. Increasing U.S. shale gas output bolsters domestic gas production, which grows from about 66 Bcfd in 2011 to almost 79 Bcfd in 2018 before tapering off.

Figure 6. U.S. gas production by type



Gas production in Canada is projected to decline over the next several years, reducing exports to the U.S., and then gradually increase. The recent trend in the decline of the Western Canadian Sedimentary Basin is projected to continue until the end of the decade, when output ramps up from the Horn River and Montney shale gas plays in Western Canada. Further into the future, the Mackenzie Delta pipeline may begin making available supplies from Northern Canada. Mexican production is projected to eventually grow slightly but not nearly enough to keep pace with its domestic demand growth.

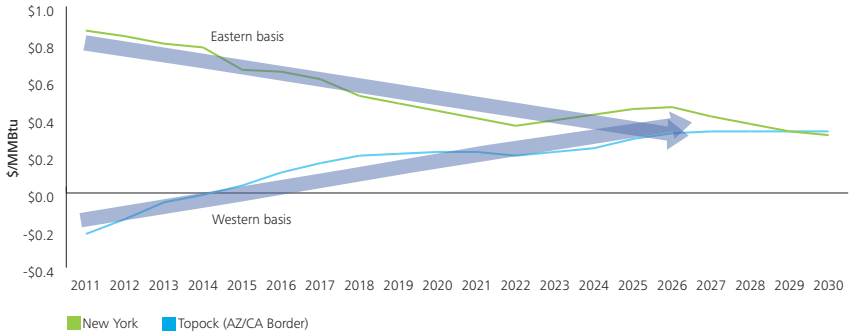
It is important to note that the projected tapering off of U.S. production reflects the increasing competition from LNG imports as well as resource depletion. Imports from outside North America, and eventually from Canada, are projected to eventually displace some higher-cost domestic production. Rather than basing our production projections solely on the physical decline of producing fields, the WGM considers economic displacement as new, lower cost supplies force their way into the market.

4) **Basis relationships change drastically.** Increasing production from major shale gas plays, many of which are not located in traditional gas-producing areas, is projected to transform historical basis relationships during the next two decades. Varying rates of regional gas demand growth, the advent of new natural gas infrastructure, and evolving LNG imports may also contribute to changes in regional basis, though to a lesser degree.

Most notably, gas prices in the Eastern U.S., historically the highest priced region in North America, could be dampened by incremental shale gas production within the region. Mid-Atlantic and Northeastern bases to Henry Hub are projected to be depressed under the weight of surging gas production from the Marcellus Shale. The Marcellus Shale is projected to dominate the Mid-Atlantic natural gas market, including New York, as it meets most of the regional demand and pushes gas through to New England and even to South Atlantic markets. Pipelines built to transport gas supplies from distant producing regions — such as the Rockies and the Gulf Coast — to Northeastern U.S. gas markets may face stiff challenges.

Meanwhile, Western U.S. prices are projected to rise faster than those in other parts of the nation due to the region's comparatively small supply, absence of LNG import terminals, and declining gas production in Western Canada. Over the long term, California prices are projected to be higher than Mid-Atlantic prices, a dramatic reversal from historical relationships. As shown in Figure 7, Eastern basis, represented by New York City, will fall and Western basis, represented by Topock, AZ, will improve relative to Henry Hub prices under this scenario.

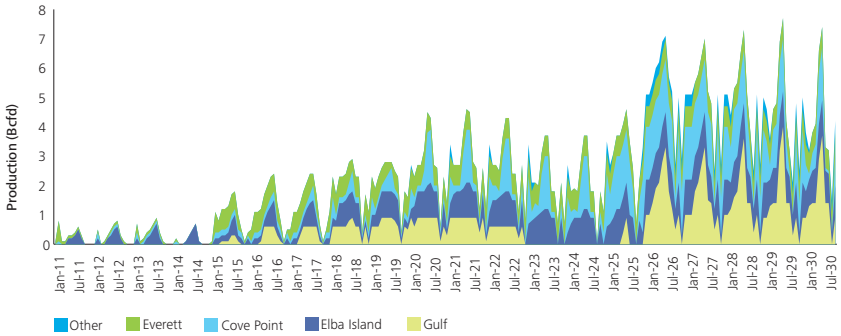
Figure 7. Dramatic shift in basis relationships



5) **U.S. LNG imports rise in the longer term.** Although the immediate future may be rather bleak for U.S. LNG importers, LNG imports are projected to grow significantly in the middle of this decade and eventually rise to comprise a fairly significant component of U.S. natural gas supply under this scenario. Average annual U.S. LNG imports increase from less than 0.5 Bcfd in 2011 to almost 4.0 Bcfd by 2030 (see Figure 8). Although shale gas production does not completely dislodge LNG from the U.S. gas market, it both delays and limits the extent of growth of LNG imports. Consequently, existing U.S. LNG regasification capacity is not fully utilized during the next two decades. U.S. LNG imports remain modest in the near term as U.S. shale gas production burgeons and as higher gas prices in Europe and Asia draw flexible LNG cargoes to those markets and away from the U.S. However, even as U.S. gas demand rises and as global LNG supplies increase, LNG import volumes are far less than existing LNG import capacity. Hence, based on the WGM output, there is no projected need for additional LNG import terminals to be constructed along the U.S. Gulf Coast.

The projected increase in LNG imports might call into question the long-term viability of plans to export domestically produced LNG, unless backed by long-term contracts with sufficiently high prices. As U.S. gas prices rise and European and Asian gas prices moderate, the economic incentive to export LNG from North America could dwindle. However, it should be mentioned that the Reference case assumes the costs to produce shale gas do not markedly decrease from current levels. (An alternative scenario, presented below, demonstrates that if significant cost reductions occur, the need for LNG imports largely disappears.)

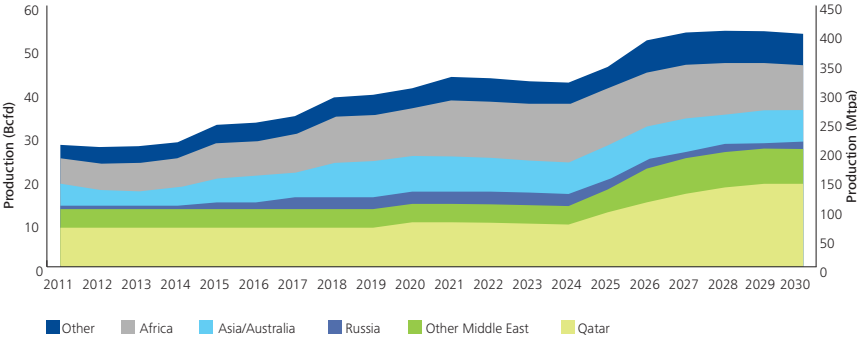
Figure 8. Projected volumes of U.S. LNG imports



Selected WGM global gas market projections

1) **World LNG supply continues rapid growth.** Growth in global gas demand will continue to spur nations with stranded gas supplies to develop and monetize them through LNG exports. As a result, world LNG supply is projected to increase by about 50% over the next decade, rising from about 28 Bcfd (220 million tons per annum (MTPA)) in 2011 to about 41 Bcfd (320 MTPA) in 2020, and reach 54 Bcfd (425 MTPA) by 2030 (see Figure 9). Much of the incremental supply this decade comes from liquefaction projects that are either already under construction or in the final investment decision stage, including many of which are located in Australia. In the longer term, Qatar, with its vast, low-cost gas supply is assumed to be joined by new LNG entrants such as Iran and Venezuela in providing additional incremental growth.

Figure 9. Projected world LNG production



2) **European and Asian gas prices soften relative to U.S. prices, and oil indexation of gas contracts faces increased pressure.** As more international pipelines and LNG supply trains enter service, increasing volumes of gas are expected to flow to Europe and Asia from prolific supply basins in North Africa, the Middle East, the Caspian region, and Russia. Suppliers of gas to these regions may find it more difficult to insist upon oil-price indexation in the face of growing competition among suppliers and mounting pressures on importers from their own customers who want competitively priced gas. As a result, European and Asian prices are projected to decline over time while U.S. prices firm. The net result is that the price differential to Henry Hub would likely narrow.

Alternative scenarios

North American gas executives are all too familiar with market risks and the pitfalls of following conventional wisdom. In the middle of the last decade, many pundits declared that natural gas prices would stay at high levels as North American production had reached its peak and started on a protracted downward trend. In fact the opposite occurred and the U.S. market has entered a period of robust gas supply and low gas prices ushered in by substantial production from shale gas. Many point to massive technologically recoverable shale gas volumes in North America as a sign that low prices are here to stay. Will conventional wisdom once again prove to be wrong? The alternative market scenarios provide insights into future trends.

Scenario 2: Grand Slam for Gas

The Grand Slam for Gas scenario analyzes factors that may drive global demand more rapidly in the coming decades. In this scenario, the largest catalyst is the rapid growth in natural gas demand from China, which has sustained a double digit annual growth rate over the past decade. We assumed that China's growth rate would be sustained at 7.5% per year through 2030. Hence, China's demand more than quadruples from 2011 to 2030. The Chinese demand in this scenario is 16 Bcfd greater in 2030 than in the Reference case.

We also assumed that the nuclear disaster in Japan would permanently shut down some existing nuclear plants and curtail plans for future nuclear expansion in Japan. For this scenario, we assumed that Japan will eventually shut down 60% of its nuclear capability for a reduction of 30.5 gigawatts (GW). We assumed that all of the displaced nuclear power will be replaced by gas-fired generation, leading to more than 6 Bcfd in incremental gas demand in Japan by 2030.

The nuclear situation in Japan has also prompted other countries to review their nuclear programs. Germany has announced plans to shut down all of their nuclear plants with a combined capacity of 20.3 GW by 2034. Even Switzerland has decided to shut down its three nuclear plants (3.2 GW). Under this scenario, we assume that the lost electricity generation by shutting down nuclear power plants in Europe would be replaced by additional gas-fired generation, leading to about 1.5 Bcfd in incremental gas demand by the time all of the scheduled shutdowns occur. In the United States, the Japanese nuclear disaster is likely to make building new nuclear plants more difficult and more costly. Hence, we assumed no new nuclear plants would be built, but existing plants and those currently under development would not be affected. The lack of new nuclear plants causes gas demand to increase by about 10 Bcfd in 2030 in this scenario, as most of the new nuclear power that was projected to be built is replaced by gas-fired generation.

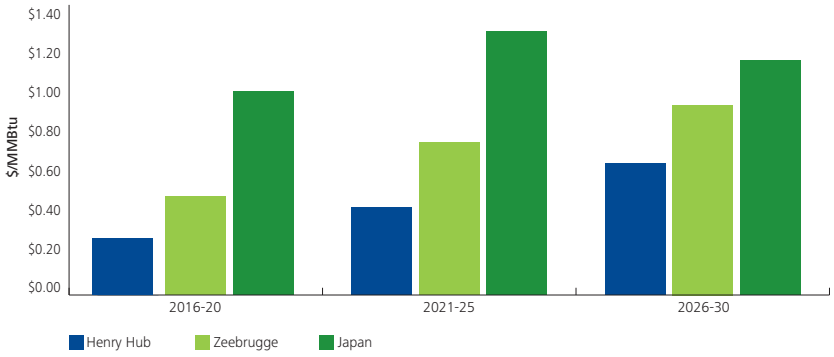
The world gas demand is projected to grow to 466 Bcfd by 2030, a 12% increase over the Reference case. The annual growth rate for this scenario is assumed at 2.4% compared to 1.9% in the Reference case.

Projected global impact

The projected price impact, shown in Figure 10, of the Grand Slam for Gas scenario is significant, grows over time, and varies by region. Clearly the hardest hit region is Japan, which we assumed would suffer the greatest loss of nuclear power. Japan has no domestic gas production to buffer an increase in gas demand and in our model, must rely entirely on LNG imports for its gas supply. The sharp price impact, about $1.00/MMBtu, is felt even in the near term as Japan has to bid LNG cargos away from other destinations to meet its increased need for gas for power generation. European markets are significantly affected in this scenario, because European gas demand has increased as a result of nuclear shutdowns in Germany and Switzerland. Furthermore, Europe must compete with Asia for LNG imports, projected to increase over time, and must compete with China for Caspian supplies which can flow to China through a newly constructed pipeline from Turkmenistan to China. Europe's strong interconnection with Asia in the global gas market causes European prices to rise beyond what would result simply from the assumed demand increase. The price impact at Zeebrugge, an established gas trading hub in Belgium, is projected to be about $0.40/MMBtu in the near term (2016-20) and then grow over time to reach more than $0.90/MMBtu by 2026-30. Prices in the United States are the least affected. However, as U.S. LNG imports grow and the impact of no new nuclear power plants takes hold, the price impact at Henry Hub is projected to grow from more than $0.26/MMBtu to more than $0.63/MMBtu by 2025-30. Hence, global markets are all affected and the price impacts grow as demand impact increases over time. Furthermore, impacts are more widely spread as the linkage between global markets grows. LNG imports transmit more than just gas volumes; they also transmit price and volatility signals from connected markets.

The price impact from such a large increase in demand might appear to be a bit muted but over the long term, supply would rise to meet anticipated demand growth. Unlike short-term markets in which even small supply or demand changes during peak periods can result in huge price impacts, both supply and demand are far more elastic in the long term. (Systematic shortages are not assumed to exist in the long term.)

Figure 10. Impact of Grand Slam for Gas on global prices



So what are the incremental supplies to meet the demand growth? The answer really depends on the market, but even within a single major market (e.g., United States) multiple marginal sources typically exist. LNG supply is expected to be an important marginal source in the long term. In the short term, little incremental LNG supply is available as LNG liquefaction trains typically operate at full capacity and long lead times are required to bring new LNG trains on line. However, in the long term, there are vast supplies, especially in the Middle East, that can be tapped if political and social issues are resolved.

The rest of the incremental supply is projected to come from supply basins in Europe, Asia, and North America in reaction to higher prices that incentivize more exploration and production activity in these regions. The U.S. is projected to increase production by about 11 Bcfd, mostly from incremental shale gas basins which hold plentiful gas but at fairly high cost. Recall that projected U.S. gas demand increased by about 10 Bcfd which is less than the projected production increase. The reason that U.S. production increases by more than the demand increase is that under this scenario, greater competition exists for world LNG supplies, so less LNG, about 1 Bcfd, is imported to the U.S. This again points to the importance of having a global perspective, in order to truly understand and quantify the impacts of major market changes.

Scenario 3: Lower Shale Costs

Given its vast potential and wide range of opinions, shale gas is perhaps the greatest source of uncertainty facing the North American natural gas market. Some see shale gas, with existing advanced technologies, as now being cheaper to produce than conventional supplies. In contrast, others suspect the claims made by some shale producers and analysts are wildly optimistic. Our Reference case portrayed shale gas as a diverse resource having overall costs ranging from under $5 to more than $8/MMBtu. Some speculate that continued advancements in technology will make shale gas available for under $5/MMBtu well into the future. Hence, we tested a scenario, which we call "Lower Shale Costs," in which the costs required to find and produce the gas is reduced by almost 50%. The resulting projections are quite informative and even surprising.

Figure 11 shows the price impact of the Lower Shale Costs scenario. Prices at the Henry Hub are projected to fall by almost $2/MMBtu from 2016 to 2030. The impact is more acutely felt in New York where prices fall by almost $3/MMBtu during this period. The Mid-Atlantic market, including New York, is projected to become heavily dependent on shale gas production, especially from the Marcellus, and therefore benefits more from lower shale gas production costs.

This finding raises the question of why the impacts are not greater. If we have a massive reduction in the cost of a major supply, shouldn't there be a massive reduction in price, assuming all else is equal? The answer is that all else is not equal. Markets react to change. If the cost of a marginal supply drops dramatically, then it no longer is the marginal source and something else moves to the margin and sets the price. Hence, the price impact is determined by the difference between the marginal costs rather than the price decrease of the formerly marginal supply. Figure 12 shows the anticipated impact of the decrease in shale gas production costs on domestic production. Shale gas production surges as expected, but non-shale gas production decreases as it increasingly becomes the marginal source that sets the price. Notice also that in the long term, the Other Shales, which includes shale gas plays in the Rockies and Midwest areas, is most greatly affected by the cost reduction because these were projected to be the marginal shale gas resources.

Figure 11. Impact of Lower Shale Gas Cost on U.S. prices

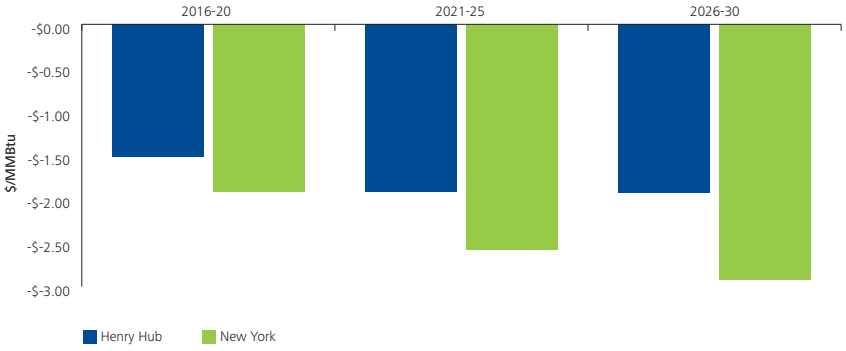
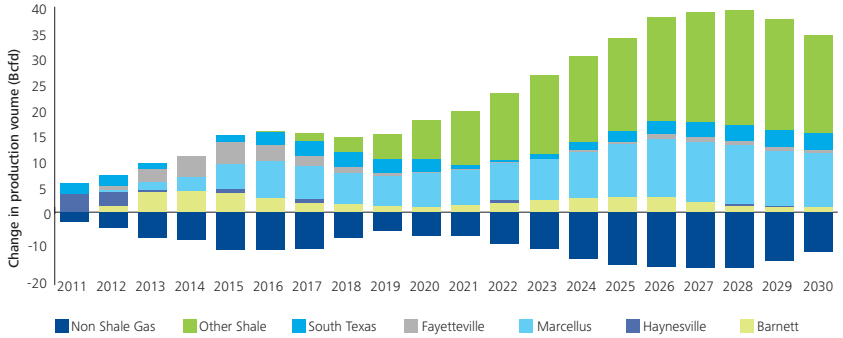


Figure 12. Impact of Lower Shale Gas Cost on projected volumes



Furthermore, the increase in volumes of shale gas production is greater than the reduction in non-shale gas production, implying a net increase in U.S. production. In fact, under this scenario, the projected net increase in U.S. production reaches about 20 Bcfd by 2025. About half of the net increase in production goes to serve a projected increase in gas consumption for power generation. Lower natural gas price would be a huge boon to gas-fired electricity generation and leads to more gas burned in the electricity sector. Under this scenario, gas demand for power generation doubles from current levels by 2030, compared to a little less than 50% increase in the Reference case. Lower U.S. gas prices also essentially drive out U.S. LNG imports. With huge, low cost shale gas maintaining downward pressure on domestic prices, LNG supplies find other higher priced markets and LNG imports to the U.S. fail to significantly ramp up despite the projected increase in world LNG supplies.

Summary

Our analysis indicates that North American prices may soon begin to firm and more closely reflect the long-term marginal cost of domestic supplies. Our models indicate that current market expectations, represented by the NYMEX futures prices, are too low to support the level of investment required to bring the necessary supplies on-line to meet projected demand. U.S. natural gas demand, led by the power sector, is projected to grow rapidly, far exceeding the projected volume by the U.S. EIA's Annual Energy Outlook 2011. Shale gas production is projected to increase to the point where it becomes the dominant domestic supply. However, it requires heavy investment which must be supported by sufficiently high prices. Furthermore, there are significant cost differences across shale gas fields and prices typically reflect the costs of marginal fields. LNG import facilities may continue to experience low rates of utilization in the near term, but the future could be far brighter as global supplies are projected to almost double between 2011 and 2030 and more LNG is expected to eventually reach U.S. terminals once higher price Asian and European markets are satisfied.

The two alternative scenarios demonstrate the importance of considering a wide range of market scenarios in order to provide a more thorough understanding of how markets are interconnected and how changes in variables affect the broader market. Under the rapid global gas demand growth assumed in the Grand Slam for Gas scenario, prices increase significantly, especially in Asia and Europe where LNG plays an important role in their supply portfolio. However, prices do not rise as much as many would expect from such a large increase in demand. As our results imply, even large increases in global demand could be met without a huge increase in price as long as the demand growth can be anticipated by the market. The world has abundant resources, although much of it in remote and difficult locations, that should buffer price impacts of demand growth in the long run as gas producers and transporters respond to that rising demand and make decisions accordingly.

Under the Lower Shale Costs scenario, North American shale gas costs are assumed to be almost 50% lower than those in the Reference case. U.S. prices fall sharply, but not nearly as much as the decrease in shale gas costs. Again, markets are interconnected and strong feedbacks take place that dampen price impacts. Shale gas production, projected to grow to comprise the majority of U.S. supply under this scenario, displaces some non-shale gas supplies and almost completely drives out U.S. LNG imports. Importantly, U.S. gas demand is projected to grow sharply in this scenario as lower gas prices increase gas demand for power generation. The supply-demand dynamics must be properly considered in order to accurately forecast future markets.

The highly volatile and dynamic natural gas market always presents new challenges and opportunities to those who can best anticipate the future. Deloitte MarketPoint can assist clients as they navigate the challenges of uncertain waters to reduce risk and gain a competitive advantage.

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